Photometric accuracy of the Agilent DRA in the NIR region using the double aperture technique

Data Sheet

Introduction/Theory

Photometric accuracy is important for many UV-Vis instrument applications, due to its influence on the quality of the analysis.

Typically, photometric accuracy is measured using standard solutions or neutral density filters, which can be obtained from a national standards organization.

Photometric accuracy determined by these methods requires the measurement to be performed at a specific temperature, spectral bandwidth and wavelength. The double aperture method does not have the same limitations, and can be used to accurately measure photometric accuracy at any temperature, SBW and wavelength.

However the technique is not suitable for measuring photometric accuracy in the NIR on some systems.

Figure 1. Cary 4000, 5000 and 6000i instruments provide excellent photometric accuracy

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The double aperture technique can be used to measure the photometric accuracy of the Agilent DRA in the NIR, as the geometry of the integrating sphere ensures that most of the transmitted or reflected light is collected without directional preference, presenting an integrated signal to the detector. For detailed information regarding the double aperture method, refer to the Double Aperture theory section of the Cary WinUV software Validation application.

The new Agilent DRA is the first to offer you the ability to measure photometric accuracy using the double aperture technique. The easy-to-follow prompts in the Cary WinUV Validate software ensure you can measure the photometric accuracy of the system quickly and easily.

The test below demonstrates the photometric accuracy of the Cary 4000/5000/6000i spectrophotometers with the Agilent DRA using the double aperture technique.

Materials

- Cary 4000, 5000 or 6000i spectrophotometer with a DRA installed
- DRA double aperture attachment, part number 9910110900
- Polarizer mount (supplied as standard)

A Cary 5000 with an internal DRA was used for this experiment

Method

1. Warm up the Cary spectrophotometer for at least 1h prior to use.
2. Align and calibrate the DRA using the Auto-calibrate function in the Cary WinUV Validate application.
3. Mount the Double Aperture Attachment on the polarizer mount of the DRA and ensure that it is aligned. Refer to the DRA online help in the Cary WinUV software for instructions on aligning and running the double aperture attachment.
4. Run the photometric accuracy using the double aperture technique from the Validate application (refer to figure below).

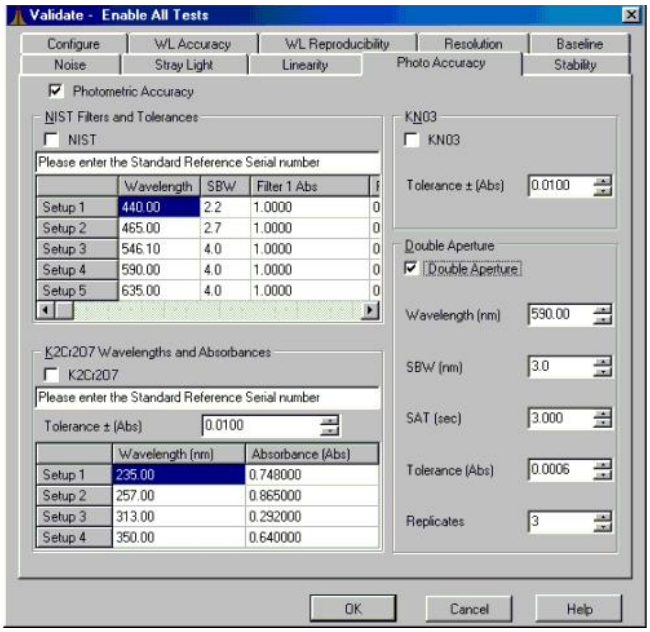

Figure 2. Validate application

Results

The photometric accuracy of the Agilent DRA was measured at both 500 nm and 1500 nm. The table below shows the absorbance error for an absorbance of 0.3 at 500 nm and at 1500 nm.

	UV (PMT) 500 nm	NIR (PbS) 1500 nm	NIR (InGas) 1500 nm
1	0.00027	0.00023	0.00081
2	0.00024	0.00093	0.00072

Figure 3. The Internal Diffuse Reflectance Accessory

Conclusion

The method above demonstrates the excellent photometric accuracy of the Agilent DRA and the Cary 4000/5000/6000i spectrophotometers.

Reference

1. Hawes R. C., Technique for Measuring Photometric Accuracy, Applied Optics, V 10 (6), 1971.
2. Mielenz K. D., Eckerle K. L., Spectrophotometer Linearity Testing Using the Double-Aperture Method, Applied Optics, V 11 (10), 1972.

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